



FACILITIES

Office Buildings in China and India Save 15-25 percent from No-cost/Low-Cost Energy Saving Measures

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Building managers from Mumbai to Beijing and Shanghai have successfully implemented simple, no-cost/low-cost measures to maximise energy and cost savings.

the opportunity

After initial research in Shanghai in 2001, eeBuildings found that energy costs are sometimes as high as 50 percent of a building's monthly operational costs, and that although building owners are interested in pursuing energy saving measures, they are less willing to make capital investment for equipment upgrades. There was also skepticism that no- and low-cost operational and management improvements could achieve substantial energy savings. Through its work in three large Asian real estate markets, eeBuildings has developed a number of case studies that document the actual successes of its partners.



The case studies presented here range from mid-size and older buildings to the tallest and newest landmark buildings in the region. Annual savings from individual cases presented are as high as US\$150,000, while the cost of implementation can be as little as near zero investment.

successful results in practice

Results from no-cost/low-cost energy saving improvements come in many varieties. They can be as simple as cleaning filters and coils, or involve more sophisticated approaches such as optimising Building Automation Systems (BAS) to improve a building's ability to monitor and improve energy use throughout the building.

Case study I

Picking the Low-Hanging Fruit: Shanghai New Town Mansion

Mr Tang Jian Ping is the property manager of the New Town Mansion in Shanghai, a fifteen year-old 27 000 sqm office building. He attended a training event on energy efficiency sponsored by eeBuildings and the Association of Shanghai Property Managers in January 2003.

Tang's first step in implementing his own strategy was to collect and analyse his building's energy bills. A close analysis of these indicated that approximately 25 percent of the building's energy use was being consumed during non-operating hours. He saw the opportunity to implement several no-cost/ low-cost measures.

Tang first optimised the lighting schedule in the building, by re-programming the BAS to control lighting operation time in public space, underground parking, the equipment room, and other areas on an as-needed basis, instead of twenty-four hours per day. He also modified the air-conditioning schedule to provide cooling from 7:00 AM to 7:00 PM on weekdays as opposed to fourteen hours per day on weekdays and on weekends. In addition, coil temperatures were reset in accordance with outdoor temperature and air-conditioner usage, while the hot water temperature was reset from sixty degrees Celsius to fifty degrees Celsius.

Tang built on the success of these measures by working together with tenants to save energy. He was able to install sub-meters on all tenant space air conditioning systems so that tenants pay for actual usage instead of an average charge per square meter.

Within two years of implementing first the no-cost, then the low-cost measures, Mr. Tang saw his energy usage reduce by 15 percent the first year to 25 percent the second year, resulting in a total of more than US\$200,000 in savings.

Case study II

Finding Savings in New Buildings: Shanghai Jin Mao Tower

Consistent with findings from the US ENERGY STAR program, eeBuildings found that even in the newest, most modern landmark buildings in cities such as Shanghai, additional savings could be found through high-quality operations and maintenance (O&M) practices.

This was the case at Shanghai's landmark Jin Mao Tower, a 290,000 sqm mixed-use building, which is the fourth tallest building in the world and is managed by JM Imtech Facility Services.

Building operations were optimised in several ways. First, management staff installed variable frequency drives in all tenant cooling systems. Second, they optimised temperatures for chilled and condensed water based on outside air conditions and the building load profile. Third, they optimised kitchen exhaust by reducing airflow and fan energy use during idle, non-cooking periods by means of temperature and optic sensors mounted inside hoods to detect heat and smoke load. Finally, staff got control of the building's pressure balance, so as to avoid infiltration and loss of conditioned air.

Low-cost retrofits of doors were also implemented. JM Imtech replaced sliding doors with revolving doors, resulting in reduced infiltration year-round and saving on heating and cooling. As a result, energy use was reduced by 20 percent annually. Furthermore, in an energy survey conducted by Servidyne Systems, LLC, Jin Mao Tower demonstrated that it used 30 percent less energy than similar buildings in comparable climate zones.

Shanghai's Tongji University, a partner of eeBuildings, has continued to provide energy use simulation modeling assistance to JM Imtech to support ongoing energy efficiency improvements. The Tongji team has been able to identify the impacts of several major energy use factors such as indoor temperature set points, building occupancy, and the outdoor climate on building energy use. This type of modeling is a more sophisticated example of how gaining a detailed understanding of a building's energy use over time can help lead to continued improvements.

Case study III

Motivating the Building Owner and O&M Staff: Shanghai Information Tower



Energy savings at the Shanghai Information Tower were the result of a unique and successful partnership forged between the property management firm, Jones Lang Lasalle (JLL), in-house building management staff, and the building owner, China Telecom. The Shanghai Information Tower is a new 100 000 sqm office building completed in 2001.

The building's in-house Facility Manager, James Sun, and his counterpart at JLL, Chance Hu, both attended an eeBuildings energy efficiency seminar convened by the Association of Shanghai Property Managers. After this seminar, Sun and Hu decided to embark on a process of understanding the building's energy use, and developing support with the building owner to carry out energy efficiency improvements.

Sun developed an approach to implementing improvements that reflected the recognition that making improvements would need the active and enthusiastic support of building management staff. Sun received owner approval for a very clever way of achieving buy-in: that was literally to buy it. He developed an innovative financial incentive system for building management staff, through which they were to receive payments equal to two percent of energy savings from operational improvements.

The staff first improved the operation of the building's HVAC and lighting systems. Building controls were reprogrammed to turn these systems on only prior to the arrival of tenants at 7:00 AM and to turn off just before tenants leave at 6:30 PM, avoiding round-the-clock operation. Building staff also improved the building's lighting control system. All lighting networks connected to the BAS were reprogrammed to be operated automatically. Previously, some lights were controlled manually.

As a result of these efforts, JLL staff has reduced energy use by 15 percent annually, saving the building owner US\$150,000 annually in energy costs.

Case Study IV

Small Adjustments Lead to Big Savings: Beijing Embassy House

No-cost/Low-cost approaches can also be implemented in residential properties. As property manager Hines discovered at the Embassy House, a 56,000 square meter residential apartment building in Beijing, attention to energy use can result in significant energy savings.

Concerned about what they considered to be higher-than-necessary energy use, Hines engineering staff initiated a competition to solicit energy saving ideas from within the Engineering Department.

As a result, Hines was able to identify and implement two low-cost measures that led to significant energy savings. First, Hines staff optimised lighting use throughout the facility by updating the Building Automation System (BAS) to control additional lighting networks and by establishing a lighting management protocol so that non-automated lighting networks would be turned on and off regularly. In addition, Hines replaced a comparatively inefficient electrical steam humidifier in the building with an evaporative humidifier.

The combined result of these two measures was an annual operating savings of nearly US\$82,000 in energy costs, with a payback of less than one year.

Case Study V

Integrated O&M and Retrofit Opportunities: ICICI Towers in Mumbai

The ICICI Bank Towers building, a 60 380 sqm office building located in the Bandra-Kurla Complex in Mumbai, has been studied widely in green building circles based on its environmentally-minded design and construction. This design included numerous built-in energy-saving features such as use of natural lighting and green rooftops. However, since June 2000, building manager Johnson Controls, Inc. (JCI) has worked with the building to implement additional no-cost/low-cost O&M and retrofit measures to further reduce energy consumption.

No-cost measures included implementing regular cleaning of filters and coils and regular checks of the quality of water in the system. Low-cost measures included a wide range of optimisation through the buildings BAS including: optimising the lighting schedule of more than 5,000 light fixtures; optimising HVAC controls including the staggering of air handling units and resetting coil temperatures based on outdoor conditions; and using carbon monoxide sensors to control garage fans to eliminate unnecessary run time.

Low- and moderate-cost measures included retrofitting inefficient lighting in the building. This included the replacement of magnetic ballasts with more efficient electronic ballasts for all fluorescent lamp fittings, and replacing over four hundred 100 Watt GLS lamps with high-efficiency, low-wattage compact fluorescent (CFL) lamps.

JCI succeeded in reducing electricity consumption by more than 12 percent and reducing the building's peak demand by more than 15 percent. The ICICI case is an excellent example of how buildings that are highly efficient by design can still offer significant energy saving opportunities through high quality O&M and targeted, cost-effective equipment retrofits.

Case study VI

The eeBuildings Approach in Practice: Tongji University and the Shanghai SIIC Tower

eeBuildings' Shanghai partner Tongji University has been reaching out to buildings in Shanghai to offer assistance in identifying energy savings using the eeBuildings principles of no-cost/low costs improvements.

The Tongji team reached an agreement to use this approach to assist the SIIC Tower, a 67 000 sqm commercial building (also an eeBuildings partner), to identify energy saving opportunities. The team began with a series of walk-through audits and data-gathering such as measurements of temperature, humidity levels, CO₂ concentrations, and indoor air quality. They also assessed the performance of HVAC and other energy-using systems.

The team then developed an energy use simulation based on the data gathered and was able to estimate savings of specific proposed measures for the building client. The team proposed a range of specific no-cost/low-cost measures including establishing routine collection and analysis of energy consumption; optimising chiller operations by resetting water temperature based on outside air temperature and controlling chiller start-up by floating load; resetting HVAC and lighting schedules to correspond to building occupancy; and others.

This approach has provided the building client with a quick and reliable set of information to inform their decision-making on how best to prioritise and implement energy saving measures.

getting the message out

As these success stories point out, building owners and managers simply cannot afford to ignore the energy and cost savings that exist in their facilities. Savings can be found in almost any size and grade of facility using straightforward approaches to analysing energy use and carrying out best practice techniques. Getting control of these savings will not only contribute to the bottom line, but will also position both buildings and building management teams to be recognised in the market for their superior and value-added management.

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eeBuildings' training and technical assistance in energy efficiency is provided to commercial building owners and managers at no cost by the US Environmental Protection Agency (EPA).

The program also helps owners and managers gain recognition for their achievements by developing case studies, which can be viewed on eeBuildings' website (www.epa.gov/eeBuildings).

For articles on the strategic value of pursuing energy efficiency in commercial buildings more detailed information on the specific O&M measures that eeBuildings recommends to its partners for pursuing no-cost/low-cost energy savings please contact RFP magazine for copies of issues 13 and 14.

Visit the program website at www.epa.gov/eeBuildings for more information

Energy Savings from Low-Cost / No-Cost Measures

